



# International Astrostatistics Association

## IAA Newsletter – June 2015

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### Message from IAA President

This Newsletter will I hope show you that the IAA has been active during 2015. I mentioned in a message to you all a couple of weeks ago why I have not communicated much with you this year. These reasons are no longer applicable, so you should be hearing from me more often in the future. I intend on preparing a newsletter every other month. However, if there is information that you should receive, I'll provide it to you as needed.

Keep in mind that you have the ASAIP (Portal) to check for updates on astrostatistically related events, conferences, articles, books, software, and so forth – you just need to access it. Eric and I also have a section for Blogs which you can be part of, or even start if you wish. Remember – and this is very important – this association is for you. It is for the discipline of astrostatistics/astroinformatics, and for those engaged in astrostatistical work.

I have had a number of requests during the past year, and especially during 2015, to support the creation of additional Working or Project Groups like COIN – the Cosmostatistical Initiative headed by Rafael de Souza. We are announcing in this Newsletter the creation of a new Section on Planetary Science Statistics, to be headed by Jamie Riggs. There are others being discussed as well. I hope to report of them in the next newsletter. These involve developing collaborative workshops which are broken out into specific project groups. Members work on specific studies with an aim to publishing the results. Both journal articles and published R, JAGS and Python packages and code have already been forthcoming from the COIN workshops, and another funded COIN workshop is now being planned for 2016.

I have also had more than several members asked about having an IAA award or awards for “Outstanding Service to Astrostatistics”, or “Outstanding Service to Astrostatistics & Astroinformatics.” At the outset of the IAA we decided to incorporate astroinformatics within the more general scope of astrostatistics. An argument can be made that statistics is a component of informatics in general, but we thought that to have an association on par with other applied professional statistical associations we should call it astrostatistics --- like biostatistics, geostatistics, social statistics, engineering statistics, energy statistics, medical statistics and so forth. Yes, we have econometrics, biometrics, psychometrics, and chemometrics and relate to astroinformatics, but it seems that astrostatistics appears to have a broader scope than astroinformatics. Both work together of course, with astroinformatics focusing on astronomical data capture and storage and astrostatistics on the statistical evaluation of astronomical data. I'll

let the committee who sets up the criteria for the award make the decision. But you can pass your thoughts about it to me and I'll pass it on to them – when it is established.

In addition, I have had requests from the time the IAA was formed some three years ago to have a committee formed who would select IAA Fellows from those who have been nominated for such an honor. Fellowship in the IAA would be given to those who have made substantial contributions to the area. Given that we currently have 542 members from 52 nations, we are plenty large enough to warrant this type of award. We were not three years ago. If you would like to be part of this process and serve on the Fellowship committee, or perhaps a Fellowship and Awards committee, please let me know.

The terms of IAA Council members and officers expire at the end of this year. My term as President is completed at the end of this year as well. A viable and lasting professional association cannot rely on one or even just a few people. It is an association of those who see value in astrostatistics and wish to see it evolve into the future. I am 70 and not in good health. I also wish to develop new statistical methods for astrostatistical application and continue writing books on statistics which can be of value to the discipline. We need someone who sees the value of astrostatistics and of having a vibrant professional association in the area to lead the IAA into the future. But we also need for members to also see this value and to set aside a bit of time to help make this association truly viable.

Most other academic and scientific disciplines have an overall professional association or society representing the discipline to the scientific community as a whole. Astronomy has the IAU, statistics has the ISI, There are also major national organizations such as the American Astronomical Society and Royal Astronomical Society in astronomy, and the American Statistical Association, Royal Statistical Society, and the International Chinese Statistical Association in statistics. We already have an astrostatistics committee in the ISI, and astrostatistics & astroinformatics interest group in the American Statistical Association, and the same in the American Astronomical Society. The IAU is about ready to have a separate permanent commission on astrostatistics – something that was not thought possible just five years ago.

I think that this is all truly outstanding. Given that in 2008 -- a mere 7 years ago -- the first astrostatistics interest group was formed within the ISI (International Statistical Institute, the world statistical organization), and that no other interest or working group, or committee, was authorized under the scope of any statistical or astronomical association, we have come a long way. We are now a true scientific discipline, bringing together statistics, astronomy and information science. 11% of IAA members are in computer information science and applied physics, and is a component of the IAA membership. In particular, it is a component of the astroinformatics side of the IAA.

The IAA also has membership divisions for PostDocs, graduate students having an interest in astrostatistics/astroinformatics, and regular members; eg tenure track professors, observatory astronomers and researchers, and so forth. Each of these components is vital in a global professional organization. PostDocs are the more immediate future of the discipline, and grad students are the longer term future of astrostatistics. PostDocs, Grad students: we do have postings for jobs and an area of those seeing jobs in the ASAIP. It's our website, so take advantage and check it out.

I plan on securing a time and place during the first three days of the IAU General Assembly in Honolulu to have a meeting of IAA members attending the convention. Guests are welcome.

Note that during the first three days of IAU a session on “Statistics and Exoplanets” is being held. It is the first-ever astrostatistics subject session to be held at IAU since its inception in 1919. Read about it more later in this Newsletter. If you are planning on attending IAU, please email me and let me know. My email addresses are: [Hilbe@asu.edu](mailto:Hilbe@asu.edu) and [j.m.hilbe@gmail.com](mailto:j.m.hilbe@gmail.com). Please to not use [jhilbe@aol.com](mailto:jhilbe@aol.com) any more. I am trying to drop it. In any event, I will contact you about a time and place when I learn of it. For those attending the ISI World Statistics Congress in Rio de Janeiro, Brazil in late July, we are also meeting. It will likely be at 12:30pm on July 27<sup>th</sup>, directly following Special Topic Session 30 (STS030): “Galaxy and related star formation history - Multivariate Statistical Investigation”, which will be held in Room 204B from 10:30-12:30. The session was organized by Asis Chattopadhyay; I am scheduled to serve as chair. I ask that those of you who are attending The ISI WSC also let me know. If there are changes I can let you know.

**IMPORTANT:** We have had several inquiries about organizing national and regional sections of the IAA so that members can meet together without having to travel to far ends of the world. I think that this is a fine idea and would like to follow up with you on this. Please email me again about your plans. I will spend the time necessary to help you from this end.

Finally, it is vital to keep growing and becoming more vital. If we don't then we risk withering away. Please seriously consider helping at this stage of our development. It's the earliest stages that are the most difficult. So far growth has been great, and we have had outstanding ASAIP web support without cost from the Department of Astronomy at Pennsylvania State University. However, there is no guarantee that Portal support will last permanently. We need to develop awards and fellowship, and additional Sections and working/project groups. Most important perhaps is to find corporate funding to support the travel of those participating in invited and special topics sessions at major conferences, but who do not have institutional travel support. Two years ago I thought I had funding, but the company that promised the funds (\$10,000/yr) sustained financial problems and withdrew their promise of support. I have purposefully waited until I thought we had enough membership, coming from a wide number of nations, and also well representing women and younger members, before preparing another proposal. I think we are at that point now and I am nearly finished preparing a formal proposal to present a mega-large international corporation which has strong ties to the scientific community. I'll keep the IAA Council apprised at each development.

Again, this is our association. I hope that you can find the time to serve on an awards or fellow committee, participate in a section or project group – or perhaps suggest and head one – and an help by providing me and others on the Council with feedback which we can use to develop a lasting professional association for the discipline. I am still going to keep bugging university statistics and astronomy/astrophysics departments to grant degrees in astrostatistics, or to form a division or department of astrostatistics, but this is now going to be left for another day.

Let me know your feedback on what I have said above. It's the only way I know to find out if I am not climbing the mountain of Sisyphus.

## Announcements Follow

# Announcing

## School of Statistics for Astrophysics clustering and classification 11-16 Octobre, 2015, Les Houches (France)

This second session of the School of Statistics for Astrophysics is devoted to clustering and classification.

Grouping objects obtained from the astronomical observations into distinct categories has always been a necessity imposed by their vast diversity. This is the case for stars, galaxies, asteroids, supernova, active galactic nuclei, gamma-ray bursts and many others. This clustering by similarities (unsupervised classification) is a prerequisite to any physical modelisation, and (supervised) classification a requirement for observations and databases

The objective of the School of Astrostatistics 2015 is to train astronomers to the use of a large range of statistical and algorithmic approaches of unsupervised and supervised classification, from the most basic to the state-of-the-art ones, including the spatial clustering, the clustering of variables and the graphical methods.

Website: <http://stat4astro2015.sciencesconf.org/?lang=en>

For additional information:

Didier Fraix-Burnet `didier.fraix-burnet@obs.ujf-grenoble.fr`  
Stéphane Girard `Girard@inria.fr`

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## COIN

Rafael de Souza has begun a website called COINtoolbox, which is part of GitHub. (<https://github.com>). It is a site from which researchers can work on projects together. The COINtoolbox is itself an IAA Cosmostatistics Initiative (COIN) project begun by Rafael over a year ago. COIN projects may be viewed at: <http://cointoolbox.github.io>

There are already some seven projects being maintained under its scope. These are:

- NB\_GC,
- GRANA (General Regression ANalysis in Astronomy),

- Clustering Stars,
- CosmoPhotoz (Photometric redshift estimator utilizing Generalized Linear Models),
- Cosmo ABC (using the Bayesian ABC methodology for modeling astronomical data) ,
- DACO (Domain Adaptation for Supernova Cosmology), and Open Exoplanet Catalogue.

The aim of each project is to produce meaningful published research, and published astrostatistical software. If you are interested in learning more about the COINtoolbox and of any of the ongoing projects, contact Rafael ([rafael.2706@gmail.com](mailto:rafael.2706@gmail.com)). He is a researcher at Eötvös Loránd University in Budapest, Hungary. Also feel free to suggest new projects.

NOTE:

Two papers prepared under the scope of the CosmoPhotoz project were recently approved for publication in the journal, *Astronomy and Computing*. They are part of a series of papers aimed to spread the use of generalized linear models among the astronomical community

de Souza, R. S., E. Cameron, M. Killedar, J. Hilbe, R. Vilalta, U. Maio, V. Bffi, B. Ciardi, J. D. Riggs for the COIN collaboration, "The Overlooked Potential of Generalized Linear Models in Astronomy - I: Binomial Regression", *Astronomy and Computing*, TBA  
<http://adsabs.harvard.edu/abs/2014arXiv1409.7696D>

Elliott, J., R.S. de Souza, A. Krone-Martins, E. Cameron, E.E.O. Ishida, J. Hilbe for the COIN Collaboration "The overlooked potential of Generalized Linear Models in astronomy- II: gamma regression and photometric redshifts."  
<http://adsabs.harvard.edu/abs/2015A%26C....10...61E>

A COIN software project recently published:

De Souza, R.S. and B. Ciardi, AMADA –Analysis of Multidimensional Astronomical Datasets  
<http://adsabs.harvard.edu/abs/2015arXiv150307736D>

The third paper in the Generalized Linear Model series has been completed and is ready for submission. R.S. de Souza<sup>1</sup>, J.M. Hilbe, B. Buelens, J.D. Riggs, E. Cameron, E.E.O. Ishida, A.L. Chies-Santos, M. Killedar, for the COIN collaboration, "The Overlooked Potential of Generalized Linear Models in Astronomy-III: Bayesian Negative Binomial Regression"

The software is aimed to facilitate the use of contemporary exploratory and visualization techniques used in a number of other scientific areas. However, these methods have not as yet been fully exploited in astronomical research. The code allows users to visualize subgroups of variables with high association in a hierarchical tree structure through diverse visual tools such as graphs, chord diagrams, dendograms, and heatmaps. .

\*\*\*\* NEW \*\*\*\*

## IAA section on Planetary Science Statistics

A NASA sponsored working on crater impact studies was held during the week of 19-22 May at the John Hopkins Applied Physics Laboratory (APL) in Laurel, Maryland. Planetary scientists with an interest in lunar and Martian impact craters from around the world met to relate their research results to others in the community and to meet with three IAA statisticians - Jamie Riggs of Northwestern University, Brian Weaver of Los Alamos National Laboratory, and yours truly representing the IAA. Considerable discussion was held regarding how contemporary statistical methods can be used to better understand impact data. Several collaborations have begun.

As a result of the enthusiasm of this branch of planetary science to the use of more advanced statistical methods into their research than they have thus far being using, we are establishing an IAA section on planetary science statistics to help coordinate collaboration between the planetary science and statistical communities. Actually, the section represents an expansion of astrostatistics/astroinformatics so that it more clearly incorporates planetary science.

Jamie Riggs is heading the new section. The hope is that workshops – both in person and extended – can be held between planetary scientists and statisticians with the aim of producing published research in the area.

If you are a planetary scientist, or are interested in participating in the section, please contact Prof. Riggs at [jamie.riggs@northwestern.edu](mailto:jamie.riggs@northwestern.edu).

From what I observed at the workshop, and as a member of the AAS Division on Planetary Science, I believe that planetary astronomers and planetary geologists both will be interested in collaborating with statisticians/astrostatisticians. We need only provide a forum and opportunities for collaborative endeavors.

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## ISI World Statistics Congress

Rio de Janerio, Brazil

Jul 27-31 July, 2015

We have two Special Topic Session in Astrostatistics being held at the World Statistics Congress

**STS030: Galaxy and related star formation history - Multivariate Statistical Investigation**

M 27 July 10:30-12:30 Room 204B

Organizer; Asis Chattopadhyay. Chair: Joseph Hilbe

Didier Fraix Burnet, IPAG, Grenoble, France.

Ajit Kembhavi, IUCAA, Pune, India <[akk@iucaa.ernet.in](mailto:akk@iucaa.ernet.in)>

Tanuka Chattopadhyay, Calcutta University, India <[tanuka@iucaa.ernet.in](mailto:tanuka@iucaa.ernet.in)>

Asis Kumar Chattopadhyay, Calcutta University

STS039: New advances in astrostatistical research

M 27 July 14:00-15:40 Room 204A

Organizer and Chair : Joseph Hilbe

Dalia Chakrabarty, University of Leicester, UK

"How much do galaxies weigh--new Bayesian state space modelling of missing data, when training sets are unavailable"

Radu Stoica, Univ. of Lille 1, FRANCE

"Pattern detection and statistical characterization for astronomical data using marked point processes"

Rafael de Souza, Eötvös Loránd Univ Hungary)

"The Fantastic Four: Bridging the gap between Cosmology, machine learning, statistics and biology"

Jogesh Babu Pennsylvania State University, USA

"A Primer for Exoplanets: statistical and computational challenges in detecting and confirming exoplanets"

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**IAU General Assembly  
and  
American Astronomical Society convention  
Honolulu, Hawaii, USA  
3-14 August, 2015**

The first-ever astrostatistics session will be held at this General Assembly – Statistics and Exoplanets from 3-6 August. The IAA is a co-sponsor of the session. Registration for IAU is at: <http://astronomy2015.org/registration>

*STATISTICS AND EXOPLANETS SESSION*

M Aug 3: FM 8 Statistics and Exoplanets I: 10:30am-12:30pm  
II: 2:00pm- 3:30pm

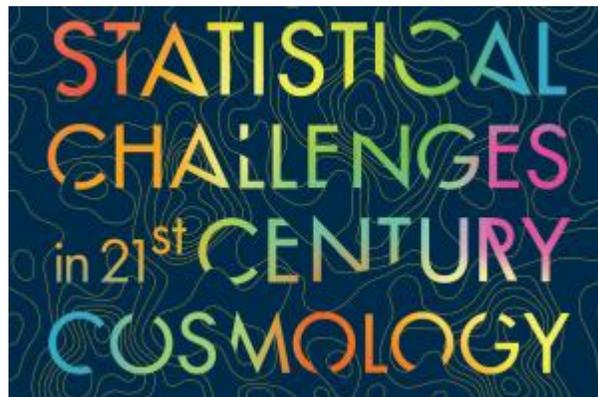
T Aug 4: FM 8 Statistics and Exoplanets III: 10:30am-12:30pm  
IV: 2:00pm- 3:30pm

W Aug 5: FM 8 Statistics and Exoplanets V: 10:30am-12:30pm  
VI: 2:00pm- 3:30pm

An IAA member meeting will be held during the dates of the session. We will discuss funding, awards and fellowship in the IAA, and the next officers and Council. Establishment of committees.

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ANNOUNCING the second edition of...



## COSMO21

24-27 May, 2016

Chania, Crete (Greece)

<http://cosmo21.cosmostat.org/>

The emphasis of the conference is on advances and methodological challenges in cosmology, and new results derived from advanced data analysis and modeling methods. Cosmology is entering a new area which will require processing of huge data sets, and measurements at the sub-percent level of accuracy in order to answer fundamental cosmological questions such as the nature of dark matter, dark energy and gravity. As ever, statistics will inevitably play a fundamental role in understanding the new generation of data, but with additional challenges of ever-increasing datasets and large parameter spaces.

### Topics

- Cosmic microwave background: non-Gaussianity, component separation methods.
- Weak lensing: galaxy shape measurements, projected mass density map reconstruction, three-dimensional mapping of the dark matter, high order statistics, Euclid, LSST.
- Large-scale structure
- High redshift supernovae.
- Mapping high- $z$  21-cm radiation
- Lyman-alpha forest
- Astronomical discovery from overwhelmingly large datasets: BOSS, EUCLID, PAU, LAMOST, LOFAR, SKA, LSST and others.

- Statistical methods used in astronomical data analysis (including new developments coming from fertile cross-interactions in astrostatistics). A preliminary list of these methods is included below:
  - Bayesian methods, evidence, model selection.
  - Multivariate classification and clustering.
  - Sparsity: wavelets, compressive sampling, 2D and 3D data representations.
  - Machine learning for large multivariate datasets: Kernel regression, Support Vector Machine, neural networks, supervised learning.

There will be several sessions during the conference. Each session will have at least one keynote speaker, and half of the talks will be contributed talks. The cross-disciplinary nature of the symposium is reflected in the inclusion of speakers from the statistics community in the suggested list.

Conference Registration and Abstract submission opens: 1 January, 2016

### Chairs, Scientific Organizing Committee

Jean-luc Starck: [jstarck@cea.fr](mailto:jstarck@cea.fr)                      Commissariat à l’Energie Atomique, France  
 Alan Heavens: [a.heavens@imperial.ac.uk](mailto:a.heavens@imperial.ac.uk)      Imperial College, London, UK

### SOC members

Bruce Bassett	University of Cape Town, South Africa	
Vassilis Chamandans	National Observatory of Athens & University of Crete, Greece	
Eric Feigelson	Pennsylvania State University, USA	
Alan Heavens	Imperial College London, UK	
Joseph Hilbe	Arizona State University, USA	
Alberto Krone-Martins	Lisbon University, Portugal	
Rachel Mandelbaum	Carnegie Mellon University, USA	
Hyranya Peiris	University College London, UK	
Anais Rassat	Ecole Polytechnique Federale Laussane, Switzerland	
Jean-luc Starck	Commissariat à l’Energie Atomique, France	
Panagiotis Tsakalides	University of Crete & FORTH/ICS ,Greece	Chair, LOS
Yanxia Zhang	National Astronomical Observatory, China	

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# Astrostatistics Books

**\*\* JUST PUBLISHED \*\***

## *Bayesian Methods for the Physical Sciences: Learning from examples in Astronomy and Physics*

**Stephano Andreon**

INAF, Osservatorio Astronomico di Brera,  
Milano, Italy

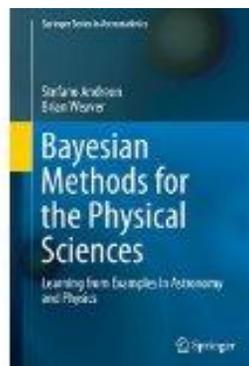
&

**Brian Weaver**

Statistical Sciences, Los Alamos National Laboratory  
Los Alamos, NM, USA

ISBN-13: 978-3319152868

The 4<sup>th</sup> volume in the Springer Series in Astrostatistics. Published as hardback and e-book. 235 pages. List price \$109.00.



### FROM THE WEB SITE

Statistical literacy is critical for the modern researcher in Physics and Astronomy. This book empowers researchers in these disciplines by providing the tools they will need to analyze their own data. Chapters in this book provide a statistical base from which to approach new problems, including numerical advice and a profusion of examples. The examples are engaging analyses of real-world problems taken from modern astronomical research. The examples are intended to be starting points for readers as they learn to approach their own data and research questions. Acknowledging that scientific progress now hinges on the availability of data and the possibility to improve previous analyses, data and code are distributed throughout the book. The JAGS symbolic language used throughout the book makes it easy to perform Bayesian analysis and is particularly valuable as readers may use it in a myriad of scenarios through slight modifications.

Also remember

## *Statistical Methods for Astronomical Data Analysis*

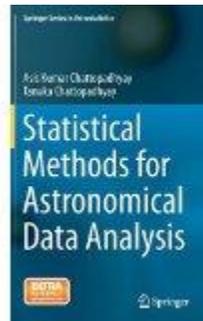
Asis Chattopadhyay  
University of Calcutta  
&  
Tanuka Chattopadhyay  
University of Calcutta

Published 2 October, 2014

ISBN: 978-1493915064 hardback and ebook formats

Volume 3, Springer Series in Astrostatistics

349 pages



### BACK COVER

This book introduces “Astrostatistics” as a subject in its own right with rewarding examples, including work by the authors with galaxy and Gamma Ray Burst data to engage the reader. This includes a comprehensive blending of Astrophysics and Statistics. The first chapter’s coverage of preliminary concepts and terminologies for astronomical phenomenon will appeal to both Statistics and Astrophysics readers as helpful context. Statistics concepts covered in the book provide a methodological framework. A unique feature is the inclusion of different possible sources of astronomical data, as well as software packages for converting the raw data into appropriate forms for data analysis. Readers can then use the appropriate statistical packages for their particular data analysis needs. The ideas of statistical inference discussed in the book help readers determine how to apply statistical tests. The authors cover different applications of statistical techniques already developed or specifically introduced for astronomical problems, including regression techniques, along with their usefulness for data set problems related to size and dimension. Analysis of missing data is an important part of the book because of its significance for work with astronomical data. Both existing and new techniques related to dimension reduction and clustering are illustrated through examples. There is detailed coverage of applications useful for classification, discrimination, data mining and time series analysis. Later chapters explain simulation techniques useful for the development of physical models where it is difficult or impossible to collect data. Finally, coverage of the many R programs for techniques discussed makes this book a fantastic practical reference. Readers may apply what they learn directly to their data sets in addition to the data sets included by the authors.

PREVIOUS SERIES BOOKS

- 1: *Astrostatistical Challenges for the New Astronomy* Joseph M. Hilbe
- 2: *Astrostatistics and Data Mining*, Luis Manuel Sarro, Laurent Eyer, William O’Mullane, Joris De Ridder

IN PREPARATION

Hilbe, J.M, R.S. de Souza, and E.E.O. Ishida (2016), *Bayesian Models for Astrophysical Data*, Cambridge University Press

If you are working on an astrostatistics book, or know of someone who is, please let me know and I’ll let other IAA members know as well. Contact me at [hilbe@asu.edu](mailto:hilbe@asu.edu)

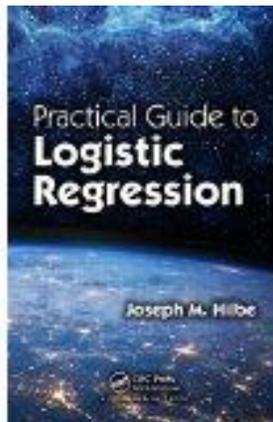
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Statistics book due out in July...

*Practical Guide to Logistic Regression*

Joseph M. Hilbe

- ISBN-13: 978-1498709576  
Paperback: list price \$49.95  
Pages: 176



R code is used throughout for all model examples. Guidelines on constructing, modeling interpreting, and evaluating logistic models from both a frequentist and Bayesian perspective. Logistic models are used to estimate the probability that an event occurs. In addition, the exponentiation of logistic model coefficients are odds ratios.

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## Astrophysics Source Code Library

The [Astrophysics Source Code Library](#) (ASCL) is a free online registry for source codes used in research in, or submitted to, peer-reviewed publications. The ASCL currently has over 1000 code entries and is indexed by the [SAO/NASA Astrophysics Data System](#) (ADS). Its entries are [citable](#) by using the unique ascl ID assigned to each code, and each code entry's can be found by prefacing the number with [ascl.net](#) (i.e., [ascl.net/1201.001](#)).

Additional information will be posted on the forthcoming April ASAIP Blog. Contact Alice Allen for details of the library ([alice.allen1@verizon.net](mailto:alice.allen1@verizon.net))

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## ASAIP BLOGS

Each month Eric Feigelson and I, as the ASAIP editors, have been posting items of interest to the astrostatistics community on the ASAIP Blog site. We believe that it may be more helpful, and accurate, to let those who manage other websites, or direct other related astrostatistics and astroinformatics activities, to advise you themselves regarding their activities and announcements. Be on the lookout for the April Blogs on ASAIP, which will be published very soon. We hope that it will grow each month. Please check the ASAIP Blog site each month around this time or a bit earlier. Also, send me details of anything you wish to announce to the greater IAA community through the Newsletter – which is sent out to all IAA members.

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## Check out the ASAIP

If you have not accessed ASAIP (Portal) in awhile, do so and check out the many new features. Lots of URLs and articles to download related to various aspects of astrostatistics and astroinformatics.

# International Astrostatistics Association

## Officers and Council members

<through 2015>

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Jean-luc Starck - astronomical sciences		jstarck@cea.fr
Kirk Borne - astroinformatics		kborne@gmu.edu
Bruce Bassett - at-large		bruce.a.bassett@gmail.com

### IAA COUNCIL:

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